Some males are of a richer or more orange-yellow on the breast and superciliaries, and of a richer reddish-brown tinge on the back than others.

In the first plumage the young male has no yellow on the head; the feathers of the crown are brown edged with black; the superciliary stripe is light yellowish brown; the stripe beneath the eye is similar to that of the adult female; the throat and sides of the neck are dull white, the feathers slightly edged with black; there is no black pectoral band; the breast is light brown, the feathers being tipped with black, not barred; the wing-coverts are spotted with brown; the back is dusky brown; there is no blue on the rump.

XLVI.—*Notes on certain Species of New-Zealand Birds.*

By W. W. Smith, Ashburton, N.Z.

Although the New-Zealand avifauna is the most perfectly known division of our zoological province, new facts in the life-history of some of the species are occasionally presented to the ornithologist. Sir Walter Buller's charming delineations of bird-life in all its peculiar forms in New Zealand, together with Mr. Keulemans's exquisitely finished and life-like pictures of many species illustrating Buller's work, have produced an ever-increasing and lasting interest in our remarkable birds. If Mr. Keulemans had studied bird-life in forests and lakes and sea-shores in New Zealand for many years, he could not have depicted the birds in more natural postures, or painted their haunts to greater perfection. In the individual history of most species Buller has left little of interest to be added; in others additional features in their habits will transpire as colonization spreads and the country becomes more settled. Since the second edition of the 'Birds of New Zealand' appeared in 1887, I have been able to gather additional notes on the habits of many species, some of which I now offer; I also add some observations on the causes of the extinction and gradual disappearance of certain native birds.

MYIOMOIRA MACROCEPHALA, Gray.

In the month of January, when the family cares are over for the season, many adults and young leave their inland bush haunts and disperse over the plains, visiting the gardens and the plantations of the settlers. They remain about farm homesteads and are common in the vicinity of towns till the month of August, when they again return to the bush to pair and breed. The migratory habit is due to the presence of more food in the settled districts than in the vicinity of the bush. The ploughing of paddocks and digging of gardens and orchards offer an abundance of food for them in the form of earthworms and beetle larvæ—the latter (*Odontria* sp.) seriously affect paddocks; and while ploughing is proceeding the birds venture far into the open.

GERYGONE FLAVIVENTRIS, Gray.

This is another visitant to the smaller plantations and hedgerows in settled districts in winter. The Grey Warbler is oftener heard trilling its pleasant song in the hedgerows than the bird is seen. Its active flitting motions are well adapted to threading its way through the thick hedgerows or the dense undergrowth of the bush. It frequents clumps of close-growing young manuka trees and flax-flats, where it obtains abundance of food. On the 14th of November last I heard an adult singing in the willow-trees growing on the river-bank. I have no record of the Riroriro nesting anywhere on the plains, and its presence in the willows in November, thirty miles from the nearest native bush, is remarkable. There are several large clumps of manuka trees still existing on the plains, and as the young saplings are a favourite site for the Riroriro's nest, they may occasionally breed in them. Several of its foster children, the Long-tailed Cuckoo (*Eudynamis taitensis*), were shot here in February, but they were all adults. Possibly we may yet be able to record the nesting of the Riroriro on the plains.

RHIPIDURA FLABELLIFERA, Gray.

RHIPIDURA FULIGINOSA, Sparrm.

Both these Flycatchers visit and remain in settled districts all over the plains in winter. They do not decrease, as they reappear in undiminished numbers annually. The presence in gardens and the airy graceful movements of the "gentlest representatives of the New-Zealand avifauna" are always objects of delight to both old and young people.

MIRO ALBIFRONS, Gray.

The tame and inquisitive Wood-Robin is still fairly plentiful at Peel Forest, Mount Somers, and Albury Bush. Like the *Anthornis* it is slowly increasing, and at present it bids fair to flourish in good numbers in a few years. It, however, never leaves the bush, and is the first bird to greet the visitor on entering it.

SCELOGLAUX ALBIFACIES, Gray.

During the last five years I have paid occasional visits to the limestone rocks at Albury to obtain specimens of this fine Owl, but without success. The rocks were formerly a favourite haunt of the *Sceloglaux*, and were for several years my "happy hunting-grounds" for this and other rare species of native birds. At that time (twelve years ago) the rocks were badly infested with rabbits, and in order to reduce their numbers the owners of the land on which the rocks are situated liberated a large number of ferrets in the district; in a few years the rabbits decreased, and with them the *Sceloglaux*. Its laughing call is still heard occasionally about the Kakahu rocks, fourteen miles from Albury, and about the rocks in the Opihi Valley, midway between these two districts; it also occurs about rocks in the Clutha Valley, Otago, but is annually becoming one of our rarest species.

LARUS DOMINICANUS, Licht.

At the freezing-works now established in several districts in New Zealand great quantities of offal daily accumulate and are removed from the slaughter-yards into the adjoining paddocks to be again removed. The offal is a great attraction to the Sea-Gulls, and large numbers of these birds daily frequent the yards and paddocks, subsisting on both the fresh and putrid refuse. It is interesting to watch the Gulls tearing off and bolting large pieces of fat or intestine, and occasionally disputing each other's right to the morsels. I have seen numbers of them sitting about in the vicinity of the works with distended crops, gorged to repletion. Both young and old revel in the feast, and their wild excited cries are heard a long distance from the works.

ARDEA EGRETTA, Gm.

Last August Mr. A. Craighead, of Black Forest Station, McKenzie Country, wrote to me to say that he had recently seen a specimen of the White Heron near the head-waters of the Waitaki River. This is the only record of its occurrence east of the main range for fifteen years.

ANTHORNIS MELANURA, Gray.

The history of this delightful songster of the New-Zealand bush is so perfectly given by Buller that nothing need be added to it here. The sudden disappearance of this species from many of its old haunts in the North Island, and the apparently inevitable extinction that similarly threatened it in the South Island, was truly deplored by all naturalists. The causes to which are attributed the gradual or rapid disappearance of certain species of New-Zealand birds have been fully discussed by Buller; these include the probable effects of the introduced honey-bee on the habits of the *Meliphagidæ,* the changed environment produced by the perfect or imperfect clearing of open swampy lands and forests, and the introduction of predatory animals. In discussing the various causes and their effects, he contended that the honey-bee theory was "quite insufficient to meet the case," and stated, "As the result of long observation I have come to the conclusion that, apart from the effects produced by a gradual change in the physical conditions of the country, the chief agent in this rapid destruction of certain species of native birds is the introduced rat." Referring in 1887 to the disappearance of *A. melanura,* Buller wrote: "Doubtless it is only a question of a few years, and the sweet notes of this native songster will cease to be heard in the grove; and naturalists, when compelled to admit the fact, will be left to speculate and argue as to the causes of its extinction"[*]. After a lapse of six years I now venture to give a more hopeful view of the case by demonstrating that some cause favouring the native meliphagous birds is again on the ascendant, which bids well at present to re-establish *A. melanura* within the next decade, at least if no counteracting force comes into play. For several years I have frequently visited Alford Forest and Mount Somers bush in Mid-Canterbury, Peel Forest and Albury bush in South Canterbury, and have on the occasion of each visit found this species to be considerably increasing. I lately stayed ten days at Winwood, Mount Somers, and daily found the birds, both adults and young, in good numbers inhabiting the warm wooded valleys of the Gawlor Downs. When at Albury, two months ago, I again found *A. melanura* in considerable numbers inhabiting the bush-covered slopes of the Tengawai Gorge. Twice I was on the top of Rocky Peninsula at daybreak listening to the waking melody of the Bell-bird echoing across the gorge from the opposite bush. Both mornings were serene and beautiful, and the mingling of the songs of numerous birds with the soft murmur of the river far below presented one of those enchanting scenes in bird-life daily realized by the ornithologist in New Zealand. I am informed by Mr. R. Beck, inspector of roads and bridges for Westland, that the Korimako is still plentiful in some of the districts that he visits. The causes which have exterminated some species of birds and have greatly reduced the numbers of others on the eastern side of the Alps cannot have so materially affected or reduced the numbers of the same species inhabiting the forest-clad region of Westland. The forests on the eastern side of the South Island are of limited extent, and were the first to be worked or cut out by the colonists of the South Island for building-timbers and fuel. The thinning and clearing of the smaller forests of many trees and shrubs bearing melliferous flowers would appreciably affect the honey and insect supply of food of both meliphagous and insectivorous birds in a short space of time. To see a number of Korimakos in the spring months regaling themselves on the sweet flowers of the kowhai, ngaio, papauma, tawhiwhi, and manuka trees is one of the naturalist's charms of the year. But, alas! from several districts, where only a few years ago these sylvan scenes were present, the forest flowers and the sweet song of the Korimako have vanished, and the flocks of the farmer now occupy their sites.

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[*] Birds of N. Z. ed. 2, vol. i. p. 87.

While studying the changes in the New-Zealand avifauna it is imperative to first consider the primitive state of the islands. The remote and long separation of New Zealand from any continental area, and the development of the remarkable extinct and existing avifaunas within its limits, would require long and steadily evolving epochs to develop the numerous bygone and the living anomalous species peculiar to the New-Zealand region. Let us take a glimpse at the natural features and climatic conditions of New Zealand twenty-five to forty years ago, and the methods of colonization practised by the settlers, and we shall readily understand how the results were so disastrous to the native birds. The plains of Canterbury were "billowy bays of grass" inhabited by the native Quail (*Coturnix novæ-zealandiæ*). The rich forests then clothing the flats and spurs of the lower ranges existed in their natural freshness, and were replete with many forms of endemic birds. In a few years the whole of the plains had been repeatedly swept by grass-fires, and as a result the Quails vanished rapidly. The fires would occasionally sweep through extensive flax-flats, and destroy the prospects of a good flowering season. The stately and melliferous flowers of the flax yield a rich supply of food to the Korimako and Tui (*Prosthemadera novæ-zealandiæ*) and to the Kaka Parrot (*Nestor meridionalis*) in the early summer months. It is very interesting to watch these birds flying from flower to flower and licking up the nectar with their brush-like tongues. Many of the rich flax-flats, like the smaller forests, have been cleared and now form excellent pasture-land. The colonizing operations have produced a serious effect on the climate, and have been, I believe, the direct cause of the unequal seasons experienced in New

Zealand during the last sixteen or eighteen years. As an illustration of seasonal derangement, I may instance the several irruptions of native birds which have occurred within that time. The frugivorous and meliphagous birds were most affected. All the species of Parrakeets (*Platycercus*) swarmed into the settled districts and consumed the garden fruits in a few weeks. The green currants, gooseberries, cherries, plums, apples, pears, and quinces were alike attacked and ravenously devoured. In a former paper [*] on the Parrakeets I wrote as follows:—"During the last two irruptions they perished in thousands, as every possible method was tried to trap and destroy them; yet they compensated the settlers to a great extent by consuming the seeds of many noxious weeds, which they attacked when the green fruit in the orchards had been destroyed by them. I often observed them in large flights, consuming the seeds of *Chenopodium urbicum*, an introduced weed, which grows to the height of 4 ft. and 5 ft. and spreads rapidly. They vigorously attacked the seeds of the various species of *Sonchus*, or sow-thistles; the dock (*Rumex obtusifolius*), which grows in large masses on the bottom of sluggish watercourses; the Yorkshire fog (*Holcus mollis*); and many other injurious plants." By the 1st of March they had returned to the native bush, but in sadly reduced numbers. Along with the Parrakeets, many of the honey-eating birds visited the settlers' gardens and subsisted for weeks on the blossoms of the wattle-trees, blue gums, fuchsias, pentstemons, and many other plants growing in the flower-borders. In the same years several districts in the north and west coast of the South Island were invaded by vast numbers of bush-rats. These animals, which, as Buller and other writers have shown, subsist during the greater part of the year on the fallen mast of forest trees, were compelled, from the same cause, to migrate in search of food. In the autumn, when the forest trees have ceased blooming for the season, the honey-eaters attack the ripening fruits of the early-blooming species, and subsist through the winter on the luscious pulp and juice, combined with insect food. The latter consists of larvæ and chrysalises obtained in the decaying limbs of trees and in moss-covered trunks, everywhere abundant in the bush. A comparatively bloomless season of the forest-flora would also materially affect the more strictly insectivorous birds by inducing the Lepidoptera to migrate to other districts in search of flowers, and thus cause a scarcity of food the following season. I cannot entertain the theory of favourable breeding-seasons producing more individuals than the food-supply will support. It is unquestionably the reverse cause that produces the irruptions of certain species of birds and insects into Britain from European and Asiatic countries at varying intervals of years. In New Zealand birds of all species thus affected are invariably in an extremely emaciated and starving condition. Several native insectivorous birds are chiefly ground-feeders; the latter do not suffer so much from lack of insect-food as others do, as they are able to subsist on earthworms and coleopterous larvæ common in the layer of humus covering the bottom of the bush.

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[*] Transactions of the N.Z. Institute, vol. xxi. p. 212 (1888).

As the irruptions of native birds and the total or gradual disappearance of certain species were unknown to the Maoris before the European colonization of New Zealand, we may safely infer that they are due to certain causes operating with greater effect as colonization proceeded. The older colonists are fully aware that the seasons in the early days of Canterbury settlement were much more genial and equable than they have been of late, the summers were hotter, and the winter rains were much heavier and more periodical with fewer frosts. When the Canterbury plains were thickly clothed in tussock-grass, the latter absorbed and retained the sun's heat until cooled by showers of rain. In the spring months when the north-west or snow-melting winds blew across the plains, they took up the dry heat from the tussocks and became the "hot nor'-wester." These winds in blowing across the alpine snow-fields frequently became charged with moisture, which fell in copious showers along the base of the ranges and on the western portions of the plains. The latter are now almost cleared of native tussock, and as a result the north-west winds blow much cooler, while the north-west showers annually reach farther across the plains. The removal of the heat-absorbing tussock-grass from the plains, and of much of the bush from the base and slopes of the lower ranges on their west, is the main cause of the modification of the climate, with its disastrous effects on both insects and birds. On the cause of the irruptions of native birds I wrote in 1888 as follows:—"The cold winter of 1883, followed in the spring by severe late frosts, and the continuous cold wet summer of 1883–84, produced a wide-spread failure of the food of many species of birds. In the winter and spring followed the irruption of Parrakeets, extending over the whole of the east coast of the South Island, and on the west coast the 'plague' of rats, which swarmed into some of the towns and villages. The Tui and Korimako left their home in the bush and migrated across the open country to procure food. All were in miserable condition and on the verge of starvation. . . . . . The same season the Wood-Pigeon was miserably lean, being compelled to feed on the leaves of the kowhai and other trees, which cannot nourish and fatten like the fleshy nutritious berries of the miro and others. In the same year the habits of the Kaka (*Nestor meridionalis*) and the Silver-eye (*Zosterops cœrulescens*) were affected in a similar manner and from the same cause. I collected several specimens of the former in a plantation of English trees near Oamaru, all in a wretchedly weak and lean condition. Their presence was a rare occurrence in the district, which is about thirty-five miles from the nearest native bush. The Silver-eye, or 'Blight-bird,' frequented the gardens in the settled districts in unusual numbers, and attacked the ripe fruits, nothing coming amiss to them. All the species affected were in wretched plumage, and their bodies were infested with a species of *Acarus*"*. These facts illustrate the effects of changes of climate and environment on the economy of the native birds, but they do not explain the cause of the rapid disappearance of certain species. The Quail, the Stitch-bird (*Pogonornis cincta*), and *Notornis mantelli* have vanished, according to Buller, in obedience to "some inscrutable law

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* *Op. cit.* p. 206.

of Nature." The loss of the species affected is due to some general cause, and with the able author of the 'Birds of New Zealand' I implicitly agree that it is attributable to the ravages of rats. There is no doubt that the Norway rat was introduced into New Zealand in the early days of colonization, perhaps even in the earlier days of the visits of whalers to the South Seas, and that, there being no indigenous Mustelidæ or other natural enemies, excepting the native hawks, they multiplied in our genial climate at an astounding rate. Precisely the same thing is happening at the present time in the districts where the introduced stoats and weasels have been liberated to wage war against the rabbits. They first turn their attention to, and appease their voracious appetites on, the easily captured native birds. A writer in the 'New-Zealand Journal of Science' recently stated that a certain district in Southern Westland was now cleared of the interesting native birds by these bloodthirsty little mammals. Alas for the wisdom of the Colonial Legislature in introducing these fell destroyers into the beautiful Islands!

A few instances showing the numbers and distribution of rats in New Zealand may be of interest. About twenty-five years ago, when Peel Forest was first opened for timber-cutting, several of the bushmen afterwards informed me that wherever they pitched their tents or huts their stores were attacked in a few days by rats. Mr. Eugene Lorgerie, an old resident in the forest, once informed me that he had shot a large rat while in the act of running along a high limb of a totara tree. But the most remarkable fact about the occurrence of rats in remote places in the early days was illustrated during the gold fever on the west coast. Amid great hardships the diggers penetrated into unknown regions in that great forest country in search of the precious metal; no matter where the hardy fellows went, up lonely rivers or wooded mountain spurs, they found themselves invariably preceded by the ubiquitous rat, and the greatest precaution had to be taken to preserve their scanty supplies of food from the attacks of these animals. Rats are common everywhere in the Westland bush at the present time, and are unpleasantly numerous about many homesteads of the settlers on the Canterbury plains, and on all the Downs Country under the main range. There are two unfortunate drawbacks to most species of native birds, namely their exceeding tameness and their easily accessible nests. Before the advent of the Anglo-Saxon and his accompanying evils in New Zealand the native birds had practically no enemies to contend with, and in many districts in the South Island peace and harmony had reigned in their domain for long ages. Hence their tameness.

The causes favouring the present increase of the honey-eating birds are not very clear to me. I will mention a few facts which seem to me to have some bearing on the question, although they may be wide of the true cause. What effects the honey-bee can have, if any, on the economy of the honey-eaters, it would be difficult for the advocates of the theory to explain. But there is one fact which must be noted, namely, that the honey-bee has been a comparative failure in some districts for the last five or six years. The failure has been sometimes attributed to the introduced species of humble-bees, which have increased, like many other alien animals, at rates unprecedented in any country in the world. From observations on the habits of humble-bees in New Zealand it has been ascertained by several able observers that with the exception of six or seven plants they do not visit the native flora, and therefore cannot counteract the effects of the honey-bee on the honey-eating birds. Mr. W. H. Hudson has recently suggested in 'The Field' the possibility of the birds being stung to death when attacking and eating the bees. Such a result would be very probable if the species now disappearing attacked bees, but many of them are ground-feeders, and are confined to the dense bush where bees never enter: *Glaucopis cinerea*, *Turnagra crassirostris*, *Creadion carunculatus*, *Miro albifrons*, *Apteryx australis*, and *A. oweni* are some of the species referred to. The remarkable *Stringops habroptilus*, which feeds during the night in the dense bush, is also on the list of doomed species, yet it never eats bees. That the bees rob the honey-eaters of a little nectar during the season no man would doubt. But, after long and careful consideration of this question, I can positively say that I have never observed the bees in such numbers as to affect the honey-eaters. I have watched them daily for years regaling themselves together on the yellow kowhai blossom, and during all that time I never saw the honey-eaters attack the bees. I have also watched them feeding for hours together on the peach-blossom in spring without the least sign of molestation, nor have I ever observed them feeding on any of the numerous species of Diptera that frequent those blossoms in fine weather. It is a common feature of many of the New-Zealand plants to find ripe fruit and the next-season's blossom together on them, and on these and minute larvæ the honey-eaters subsist. Their habits and structure are specially adapted to their mode of living on honey and fruits, and their presence constitutes a daily charm in the New-Zealand bush. The honey-bee theory in its bearing on the disappearance of any of the native birds is, I am convinced, an utter fallacy. I do not know that the bees may not, in some cases, have acted beneficially on the economy of the honey-eaters by fertilizing the flowers and rendering the trees more fruitful; but this question I leave at present. The nests of the honey-eaters, like those of other species gradually disappearing, have suffered from the attacks of rats; and from the causes which have diminished the numbers of these animals in certain districts, I am able to show that the honey-eaters and other species are again increasing.

About fifteen to twenty years ago, while the thinning-out of the chief timber-trees in the larger forests of Canterbury was proceeding, much of the undergrowth and the half-grown trees were left intact. The clearing away of the larger timber enabled the younger trees to grow more freely, and at the present time they have grown into good-sized fruitful trees, bearing berries annually. Many of the forest-lands have been enclosed and are used as grazing paddocks. In the forests and patches of bush on private estates sheep and cattle are allowed to graze, and during hot dry weather they roam through them feeding on the undergrowth. I have seen considerable areas of the latter cleared in a few years by cross-bred sheep, which are not so delicate in their tastes as the merino. It is therefore evident that the clearing-away of the undergrowth of the bush, and the compression of the humus and rotten wood by the animals grazing thereon, deprive the rats of their places of concealment, causing them to leave the bush and to seek food elsewhere. The stimulus given to sheep-farming by the development of the frozen meat trade has made farmers increase their flocks and use every available piece of land for pasturage. As the scrub of the bush growing on sloping spurs becomes cleared by sheep, there is the most reassuring prospect that many of the species now becoming rare will be re-established in a few years, and this apparently is one of the causes favouring the slow increase of the native honey-eaters and other species inhabiting the bush in Canterbury. In addition to the visits of *Anthornis melanura* to the blooming acacia trees in spring, the birds have of late years attacked the ripening apples on the trees in the orchards near the bush, and on that account do not get a very good name from their unkindly owners.

At the present time when the attention of naturalists is drawn towards our remarkable birds, and the apparently inevitable fate of many species, any reassuring remarks concerning any of them will, no doubt, be welcome. But in the forests of Westland, where rats are numerous and weasels and stoats are increasing, there is at present little hope of saving them from extinction. It is truly a melancholy prospect to know that many of the species belonging to the most remarkable avifauna ever evolved in any zoological region are rapidly vanishing from the earth, and that there are no apparent means available to counteract the catastrophe.

XLVII.—*A List of the Birds inhabiting the Chatham Islands.*

By H. O. Forbes, F.R.G.S., M.B.O.U.

(Plates XIV., XV.)

The Chatham Islands, which form a portion of the New-Zealand region, lie in about S. lat. 44° and W. long. 176° 30′,